SBI Probationery Officers
Quantitative Aptitude

TIME AND WORK

Time and Work are important chapters of Arithmetic and if you know the tricks, it is interesting and very useful. The time and work problems are actually practical problems and its knowledge will bring you power of taking correct decision.

★   If a man can do a piece of work in A days and another man can do the same work in B days, then they together can complete the work in $\dfrac{A \times B}{A + B}$ days.

★   Three persons A, B and C together can complete it in $\dfrac{A \times B \times C}{AB + BC + AC}$ days.

★   If 'm' persons complete a work in 'n' days then the number of days required for one person to complete that work will be m × n days.

★   **MAN DAYS:** If 'm' men can complete a work in 'n' days, then the number of man days required to complete that work is m × n

★   If M_1 persons can do W_1 work in time D_1 and M_2 persons can do W_2 work in time D_2, then the relation between these quantities is $= \dfrac{M_1 D_1}{W_1} = \dfrac{M_2 D_2}{W_2}$.

PIPES AND CISTERNS

The problems in pipes and cisterns require the application of the same basic concepts of those of Time and Work.

★   Negative work also will be there due to leakage or drain pipes in the questions.

EXERCISE

1. A can reap a field in 48 hours while A and B together can reap the same field in 36 hours. In how many hours will B alone can reap that field?

    1) 54   2) 144   3) 72

    4) 108   5) None

2. 27 men can do a piece of work in 16 days. In how many days can 36 men do that work?

    1) 20 days   2) 30 days   3) 18 days

    4) 12 days   5) None of these

3. A can do a piece of work in 40 days. He worked at it for 5 days after that B finished it in 21 days. In how many days can A and B together finish the work?

    1) 18 days   2) 24 days   3) 15 days

    4) 12 days   5) None of these

4. Two pipes A and B can fill a tank in 4 and 5 hours respectively. A drain pipe C can empty a full tank in 8 hours. In what time can the tank be filled when all the three are open simultaneously?

1) $3\dfrac{1}{12}$ 2) $2\dfrac{1}{13}$ 3) $3\dfrac{1}{13}$

4) $4\dfrac{1}{12}$ 5) None of these

5. In a garrison, provision is sufficient for 600 soldiers for 15 days. But after 5 days 100 soldiers left the garrison. For how many days more the provision last for them?

1) 10 days   2) 12 days   3) 8 days

4) 9 days   5) None of these

6. Bharath can do a work in 20 days. He worked alone for 10 days and the remaining work was completed with the help of Bhagath in 2 days. In how many days will the total work be completed if they work together?

1) 10 days   2) 3 days   3) 6 days

4) 4 days   5) None of these

7. A contractor employs 15 men to complete a work in 10 days. But after 8 days he notices that only 60% work has been finished. In order to finish the work in the stipulated time, how many more men are required?

1) 40   2) 25   3) 15

4) 20   5) None

8. A can fill a tank in 4 minutes and B can fill it in 6 minutes. If both are opened alternatively for one minute each starting with A, find in what time the tank is filled.

1) 5 minutes   2) $4\dfrac{2}{5}$ minutes   3) $4\dfrac{2}{3}$ minutes

4) 10 minutes   5) None of these

9. A contractor undertakes to do a piece of work in 30 days. He recruits 50 men at the beginning and 75 more after 20 days and completes the work in stipulated time. If he had not engaged the additional men, in how many days time the work would have been finished?

1) 15   2) 30   3) 45

4) 20   5) None

10. Two pipes A and B can fill a cistern in 14 hours and 16 hours respectively. The pipes are opened simultaneously and it is found that due to leakage in the cistern it takes 32 minutes more time to be filled up. If the cistern is full, in what time would the leak empty it?

1) 156 hours   2) 96 hours   3) 110 hours

4) 72 hours   5) None of these

11. 15 men would finish a piece of work in 60 days. If at the end of every 10 days, 5 additional men are employed, in how many days will it be finished?

1) 40 days   2) 15 days   3) 30 days

4) 50 days   5) None of these

12. A man and a boy working together can do a certain amount of work in 30 days and are paid Rs.3420. If the efficiency ratio of the man and the boy is 11 : 8, find the daily wages of the boy.

    1) Rs.66   2) Rs.56   3) Rs.114

    4) Rs.48   5) None of these

13. Three pipes A, B and C can fill a tank in 6 hours. After working 2 hours, C is closed and A and B fill it in another 7 hours. In how many hours will C alone can fill the tank?

    1) 9 hours   2) 14 hours   3) 16 hours

    4) 8 hours   5) None of these

14. If 2 men and 3 boys can do a piece of work in 8 days and 3 men and 2 boys can do it in 7 days. In how many days will 5 men and 4 boys take to complete it?

    1) 4 days   2) 6 days   3) 7 days

    4) 3 days   5) None of these

15. A and B can do a piece of work in 12 days, B and C in 15 days and A and C in 20 days. In what time can A, B and C together can complete it?

    1) 5 days   2) 12 days   3) 20 days

    4) 4 days   5) None of these

16. Two pipes A and B can fill a cistern in 20 minutes and 30 minutes respectively. A drain pipe C can remove 40 litres of water per minute. If all the three pipes are opened, it takes one hour to fill the cistern. What is the capacity of the cistern?

    1) 900 litres   2) 750 litres   3) 500 litres

    4) 600 litres   5) None of these

Key

1-2; 2-4; 3-3; 4-3; 5-2 ; 6-4; 7-2 ; 8-3; 9-3; 10-5; 11-1; 12-4; 13-2; 14-1; 15-5; 16-4.

EXPLANATIONS

1. B's one day's work $= \dfrac{1}{36} - \dfrac{1}{48} = \dfrac{1}{144}$

∴ B can reap in 144 hours

Shortcut: B can reap in $\dfrac{48 \times 36}{48 - 36} = 144$ hours

2. Let 27 men do in 'x' days

∴ $27 \times 16 = 36 \times x$

$\Rightarrow x = \dfrac{27 \times 16}{36} = 12$ days

3. A's work in 5 days $= 5 \times \dfrac{1}{40} = \dfrac{1}{8}$

Remaining work $= 1 - \dfrac{1}{8} = \dfrac{7}{8}$

B finished $\dfrac{7}{8}$ work in 21 days

B can finish the total work in $\dfrac{8}{7} \times 21 = 24$ days

∴ A & B together can finish the work in

$\dfrac{40 \times 24}{40 + 24} = 15$ days

4. A = 4 hours (+), B = 5 hours (+), C = 8 hours (−).

Three together can fill in $\dfrac{ABC}{AB + BC + AC}$ hours

$\Rightarrow \dfrac{(+4) \times (+5) \times (-8)}{(+4)(+5) + (+5)(-8) + (+4)(-8)}$

$\Rightarrow \dfrac{-160}{+20 - 40 - 32} = \dfrac{-160}{-52} = 3\dfrac{1}{13}$ hours

5. Total number of man days $= 15 \times 600 = 9000$

Number of man days completed $= 5 \times 600 = 3000$

Remaining man days $= 9000 - 3000 = 6000$

Number of soldiers $= 600 - 100 = 500$

∴ Number of days provision last $= \dfrac{6000}{500} = 12$ days

6. Work of Bharath for 10 days $= 10 \times \dfrac{1}{20} = \dfrac{1}{2}$

Remaining work $= 1 - \dfrac{1}{2} = \dfrac{1}{2}$

and this was completed by Bharath & Bhagath in 2 days

∴ The total work will be completed by them in $2 + 2 = 4$ days

7. $\dfrac{M_1 D_1}{W_1} = \dfrac{M_2 D_2}{W_2}$

Here, $m_1 = 15$, $d_1 = 8$, $w_1 = 60\%$

$m_2 = ?$, $d_2 = 2(10 - 8)$, $w_2 = 40\%$

∴ $\dfrac{15 \times 8}{60} = \dfrac{m_2 \times 2}{40} \Rightarrow m_2 = 40$

∴ To complete the remaining work,

$40 - 15 = 25$ more men are required.

8. In the first minute A fills $\dfrac{1}{4}$ of the tank

in the second minute B fills $\dfrac{1}{6}$ of the tank.

$\therefore$ In the first 2 minutes, $\dfrac{1}{4} + \dfrac{1}{6} = \dfrac{5}{12}$ of the tank is full.

and in 4 minutes $2 \times \dfrac{5}{12} = \dfrac{5}{6}$ tank is full

Now the remaining $\dfrac{1}{6}$ tank A can fill in $4 \times \dfrac{1}{6} = \dfrac{2}{3}$ minutes

$\therefore$ Total time taken to fill the tank $= 4\dfrac{2}{3}$ minutes

9. Let the work take 'x' more days without additional men

$\therefore$ $50(30 + x) = 50 \times 20 + 125 \times 10 \Rightarrow x = 15$

$\therefore$ Work would have been finished in $30 + 15 = 45$ days

10. Time taken by A & B to fill the cistern $= \dfrac{14 \times 16}{14 + 16} \times 60 = 448$ minutes

Due to leak cistern fills in $448 + 32 = 480$ minutes

Leak's one minute's work $= \dfrac{1}{480} - \dfrac{1}{448} = \dfrac{-32}{480 \times 448}$

$\therefore$ Leak can empty the cistern in $\dfrac{480 \times 448}{32}$ minutes $= \dfrac{6720}{60} = 112$ hours

11. Total number of man days required is $15 \times 60 = 900$

15 men 10 days work $= 15 \times 10 = 150$ man days

20 men's 10 days work $= 20 \times 10 = 200$ md

25 men's 10 days work $= 25 \times 10 = 250$ md

30 men's 10 days work $= 30 \times 10 = 300$ md

Total man days $= 150 + 200 + 250 + 300 = 900$

$\therefore$ The work is finished in 40 days

12. Daily wages of man and boy is $\dfrac{3420}{30} = $ Rs.114

Boy's daily wages $= \dfrac{8}{19} \times 114 = $ Rs.48

13. A, B & Cs work in 2 hours $= 2 \times \dfrac{1}{6} = \dfrac{1}{3}$

Remaining portion $1 - \dfrac{1}{3} = \dfrac{2}{3}$ is filled by A & B together in 7 hours

A & B's one hour's work is $\dfrac{1}{7} \times \dfrac{2}{3} = \dfrac{2}{21}$

C's one hour's work is $\dfrac{1}{6} - \dfrac{2}{21} = \dfrac{1}{14}$

$\therefore$ C can fill the tank in 14 hours

14. 2 men & 3 boys can do in 8 days so that 16 men & 24 boys in 1 day

Similarly, 3 men & 2 boys in 7 days so that 21 men &14 boys in 1 day

$\therefore$ 16 m + 24 b = 21 m + 14 b $\Rightarrow$ 1 m = 2 b

2 m + 3 b = 2 × 2 + 3 = 7 boys can do in 8 days

$\therefore$ 5 men + 4 boys = 5 × 2 + 4

= 14 boys can do in 4 days

15. A & Bs one day's work = $\dfrac{1}{12}$ B & Cs one days work = $\dfrac{1}{15}$ and A & Cs $\dfrac{1}{20}$

2 (A + B + C) one day's work is

$\dfrac{1}{12} + \dfrac{1}{15} + \dfrac{1}{20} = \dfrac{1}{5}$

A + B + C one day work = $\dfrac{1}{2} \times \dfrac{1}{5} = \dfrac{1}{10}$

$\therefore$ A, B and C together can complete in 10 days

16. C's one minute work is $\dfrac{1}{60} - \left(\dfrac{1}{20} + \dfrac{1}{30}\right) = \dfrac{1}{15}$ C takes 15 minutes to empty the cistern

$\therefore$ Capacity of the cistern is $15 \times 40 = 600$ litres

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